

Irrigation Management of Soft White Spring Wheat

Soft white spring wheat has quickly gained importance in the irrigated areas of southern Alberta. In 1985 approximately 40 per cent of the total irrigated acreage was sown to soft white spring wheat. It has been increasingly accepted because of its higher potential yield and wider marketing opportunities.

The primary use for soft white spring wheat is as pastry flour, which requires wheat with a low protein content. Good irrigation management has been shown to be one of the important factors in optimizing yield while still maintaining an acceptably low protein content. Soft white spring wheat has a very poor tolerance of salts at the germination and seedling stage but becomes more tolerant once the crop becomes established.

Minimum germination temperature for soft white spring wheat is 4°C. Optimum growing temperatures are from 15 - 20°C.

Crop water requirements and crop yields

In areas where there are no soil restrictions, soft white spring wheat develops an active root zone of approximately 1.0 m (3.3 ft). The seeding dates for this crop are generally between April 21 and May 7 and approximately 115 days are needed for the crop to reach maturity. The growing season is approximately from mid-May to late August, with seasonal moisture use being approximately 480 mm (19 in.). Over a 30 day period, average maximum water use may reach 7.0 mm/day (0.28 in./day). During the seedling stage, water use will vary from 1.0 - 3.0 mm/day (0.04 - 0.12 in./day) rising to a high of 7.5 mm/day (0.30 in./day) during the flagleaf to flowering stages. (See figure 1). By the time soft wheat begins to flower, the rooting system has been developed to its maximum depth with only minor root development after this time. Flowering corresponds to the time complete canopy cover occurs.

During the growing season there are two critical growth periods where moisture stress will cause a reduction in yield. Tiller initiation and development is the first critical stage; soil moisture stress during this stage will result in a growth and yield reduction that cannot be overcome by optimum soil moisture conditions during the later stages of growth.

Copies of this and related publications may be obtained from the Print Media Branch, Alberta Agriculture, 7000 - 113 Street, Edmonton T6H 5T6 or Alberta Agriculture's District Offices.

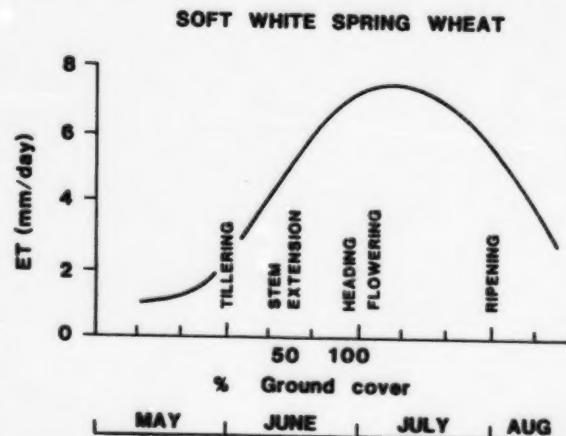


Figure 1. Daily crop water use based on crop growth stage.

The second critical growth stage is flowering. The effects of moisture stress are not as severe as at tillering, but the critical period is more defined. There are no second chances if flowers abort; that amount of yield is lost.

A positive relationship exists between consumption of water and yield (see figure 2).

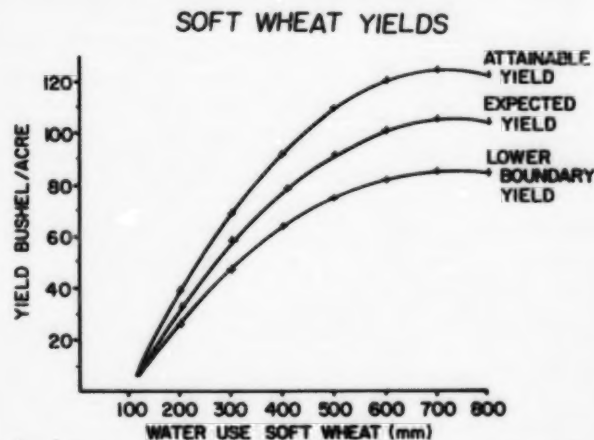
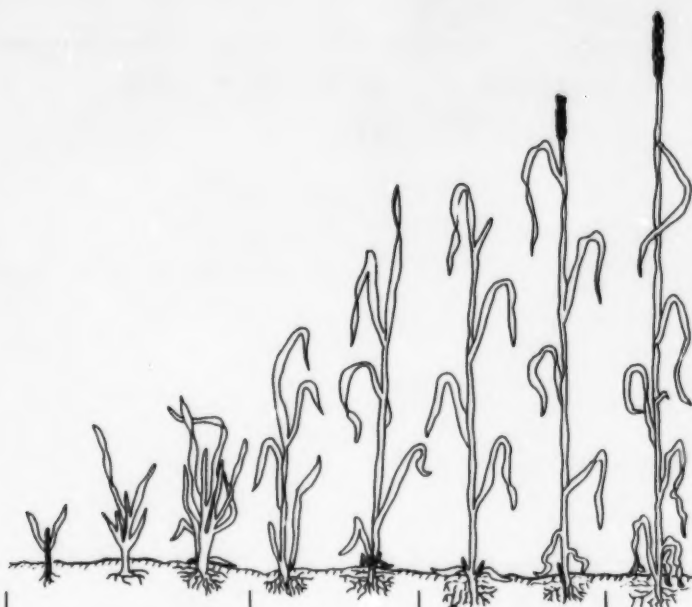


Figure 2. Graph showing the relationship between yield and water use in soft white spring wheat.

Growth and development of soft white spring wheat



GROWTH PERIODS	TILLERING	STEM EXTENSION	FLOWERING	RIPENING
POST EMERGENCE DATES	25 - 30 DAYS	45 - 55 DAYS	70 - 80 DAYS	115 - 120 DAYS
CROP * ROOTING DEPTH	1.0cm/DAY	2.5cm/DAY	MINIMAL ROOT EXTENSION	
MOISTURE SENSITIVE PERIOD**				
AVERAGE E.T.	1.0 - 3.5mm/DAY	3.5 - 6.5mm /DAY	6.5 - 7.5mm /DAY	<7.5mm/DAY

* Maximum rooting depth will occur approximately by the time flowering begins.

** For optimum production, the first irrigation will be required before the crop enters into its water sensitive period.

The above times, depths and amounts are only average values for this particular crop. These values will change depending on the variety and area where this crop is grown.

Comments

Like other cereals, soft white wheat requires nitrogen fertilizer for maximum yields, but unless the nitrogen requirements are balanced with an adequate amount of water, the protein content can rise to an unacceptable level. Growers of soft white spring wheat should have their soils tested for available nitrogen and then fertilize according to the projected crop yield.

High protein levels are likely to result not only from excess nitrogen fertilizer but also if the crop undergoes a period of water stress during the latter part of the growing season. Farmers should irrigate to maintain adequate soil moisture throughout the root zone for the entire crop growing season.

For soft wheat, the soil surface (5-10 cm) should be allowed to dry out between irrigation intervals to reduce the potential build-up of diseases such as white mold. Heavier applications of water (75 mm) are preferred to frequent lighter applications of water (25 mm). Timing of the last irrigation is crucial to ensure there is sufficient water available for the crop to mature, yet one should limit irrigation before the hard dough stage so as to not delay harvesting. Timing of the last irrigation is also important if the sprinkler system is the side-wheel-roll type which is limited in its use by crop height. A final

irrigation should be made when the irrigation system is still capable of crossing the entire field. This may involve irrigating sooner than the 50 per cent allowable depletion level, but it will ensure that sufficient water is available to meet the needs of the crop.

After harvest, soil moisture conditions tend to be at their lowest. To ensure good soil moisture conditions for the following spring, fall irrigation is recommended. Fall irrigation should take place when the amount of soil moisture is less than the 50 per cent allowable depletion level. The amount of water to be applied can be determined from soil moisture sampling. It should bring soil moisture conditions to the 50 per cent allowable depletion level. This will ensure that sufficient room is left in the root zone for any precipitation that falls over winter.

Irrigation management Information

For further information regarding irrigation management of soft white spring wheat, contact your nearest irrigation branch office. Locations of these offices are: Lethbridge, 381-5136; Vauxhall, 654-2161; Airdrie, 948-8511; Taber, 223-7908; Strathmore, 934-3356; Brooks, 362-1212; Bow Island, 545-2231; Medicine Hat, 529-3616. North of Calgary, contact the Airdrie office or your local district agriculturist for assistance.

Soil

Soils can vary greatly in texture from being very fine (clay) to very coarse (sand) within a crop root zone. Because soil texture can change quite quickly so can the amount of water that the soil is able to hold.

Texture	Available Moisture
Loamy sand	8-12 mm/0.1 m (0.9-1.4 in./ft)
Sand loam	10-15 mm/0.1 m (1.2-1.8 in./ft)
Loam	14-18 mm/0.1 m (1.7-2.1 in./ft)
Sand clay loam, clay loam, clay	15-20 mm/0.1 m (1.8-2.4 in./ft)
Silty clay loam, silt loam	16-22 mm/0.1 m (1.9-2.6 in./ft)

It is important to know and to be able to calculate the amount of moisture present in the soil root zone in order to understand the amount of moisture available for crop use. Allowable depletion level is the amount of soil moisture that can safely be removed from the root zone by a crop before an irrigation is required. For Soft White Spring Wheat, the allowable depletion level has been determined to be 50%. The simplest way to determine soil moisture content is by the "feel" method. By feeling, squeezing and observing a handful of soil, one can determine the amount of moisture present in the soil. The following chart outlines the various characteristics of soil based on differing water contents.

	PERCENT OF AVAILABLE MOISTURE REMAINING	Feel or Appearance of Soils		
		MODERATELY COARSE TEXTURE	MEDIUM TEXTURE	MODERATELY FINE TEXTURE
DO NOT IRRIGATE	At field capacity 100	Upon squeezing no free water appears on soil but wet outline of ball is on left hand.	Same as sandy loam.	Same as sandy loam.
	75 to field capacity	Forms a weak ball, breaks easily, will not slide.	Forms a ball and is very pliable; slicks readily if relatively high in clay.	Easily ribbons out between fingers, has a slick feeling.
IRRIGATE SPEC. CROPS	50 to 75	Tends to ball under pressure but seldom will hold together	Forms a ball; somewhat plastic; will sometimes slick slightly with pressure.	Forms a ball, will ribbon out between thumb and forefinger.
IRRIGATE	25 to 50	Still appears to be dry, will not form ball with pressure.*	Somewhat crumbly but will hold together from pressure.	Somewhat pliable, will ball under pressure.
	0 to 25	Dry, loose, single-grained, flows through fingers.	Powdery, dry, sometimes slightly crusted but easily breaks down into powdery condition.	Hard, baked, cracked; sometimes has loose crumbs on surface.

* Ball is formed by squeezing a handful of soil firmly.